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A Summary of Genes from Soybean Molecular Studies, 1978-85

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IX. A SUMMARY OF GENES FROM SOYBEAN MOLECULAR GENETIC STUDIES, 1978-1985

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Considerable information has been published on the molecular genetics of soybeans in the past five years. Summaries are given for nuclear genes in Table 1, chloroplast genes in Table 2, and mitochondria genes in Table 3. In a few cases, genes known from classical studies have been researched by molecular analysis (17, 24, 50).

In contrast to classical genetics in which genes are identified from allelic segregation at a locus, techniques of molecular genetics use DNA sequences in identifying genes. Single copy DNA and repeated sequences become considerations with about 40% of the soybean nuclear genome being single copy and about 60% being repetitive sequences organized primarily with long regularly repeating tandem or clustered arrays (13, 36). Gene linkages are expressed in terms of nucleotide base pairs and the size of restriction enzyme fragments; for example, see Bojsen et al. (5). Somatic cell genetics also may be used.

Table 1. Soybean nuclear genes

Actin protein: Small multigene family (19, 31, 33); pSAc3 gene (48); SAc1 gene (49).

Allantoin utilization as sole N: Allantoin genes not linked to genes for asparagine dependence (40).

Beta-conglycinin (7S) seed protein: Alpha and alpha' subunit multigene families (45, 46); alpha' subunit gene (2, 3, 47); deletion in most of the coding sequences in Cgy1 (alpha' subunit) results in cgy1 (24); 3 clones each with 2 genes (15).

Embryo mRNA: A16, A28, A36, A37 genes (16).

15 kd protein: 2 nonallelic genes (10); 15 kd1, 15 kd2 (14, 15).

Glycinin seed protein: 3 nonallelic genes G1, G2, G3 (10, 14, 15); A2B1a subunit gene (29); A1a subunit DNA (34); group II A3B4 and A5A4B3 subunit genes (41).

Heat shock proteins: hs genes (42, 43); hs 6871, hs 6834 (44).

Kunitz trypsin inhibitor: KTI genes (20); two genes separated by about 1 kb (15).

Leaf protein: nonseed protein genes (10, 15).

Table 1. Continued

Lectin: Ll, L2 genes (17, 39); Le = Ll and le = Ll + 3.4 kb insertion (17, 39); Ll, L2, SL (15).

Leghaemoglobin: Lb genes 40 copies (1); Lb gene (22); six Lb genes (5, 7); normal, pseudo and truncated Lb genes (6); Lb genes LbTl, LbT2 (7); Lba, Lbc genes (21); Lba, Lbc, Lbψ, Lbc3 and other Lb genes (25a, 25b, 28); Lb genes (26, 27, 55, 57, 59, 60, 61); LbC3 gene (30); Lbc-2 and Lbc-3 (64).

Meso-diaminopimelate dehydrogenase: gene (63).

Non-Lb: genes linked with Lb genes (5).

Nodulin (nodule protein): Low copy NodA, NodB, NodC and NodD low copy gene sequences (12); nodulin-23 gene (30); nodulin-24 gene (23, 30); nodulin genes (58, 59, 60, 61).

Ribosomal RNA: 17S and 25S genes linked and tandemly repeated (56); 18S and 25S tandemly repeated multigene family (8); 18S gene (9); 18S, 25S and 5S genes (11).

Ribulose-1,5-bisphosphate carboxylase/oxygenase small subunit: SSU gene SRS1 of a multigene family of at least 10 genes (4).

Urease: Gene fragment (62).

Table 2. Soybean chloroplast genes

ATP synthase: Gene atpH for subunit III of the CF-0 component (52); atpA, atpB, and atpE genes for alpha, beta and epsilon subunits of CF-1 component (52).

Cytochrome f of cyt b6/f complex: Cyt F gene (52).

Cytoplasmic chlorophyll deficiency: *cyt*-Y2 probably result of single point mutation in a regulatory portion of genome rather than in a structural gene (50).

Photosystem II thylakoid membrane: 32 kd protein *psb*A gene (52, 53, 54).

Ribosomal rRNA: 16S and 23S one copy and inverted repeat one copy (35, 51, 54).

Ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit: rbcl (52, 54).

Transfer RNAs: tRNAl-Leu, tRNA2-Leu, tRNA3-Leu genes (37, 38); tRNA2a-Leu, tRNA2b-Leu genes (37); *trn* H gene (53); tRNA-Ile gene (51).

Table 3. Soybean mitochondria genes

Cytochrome b:	Gene, low copy number (66).
Ribosomal rRNA:	18S gene (18); DNA rearrangement involving 5S gene (32).

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